

MEASURE NO. 70  
SOURCE CATEGORY Highway Vehicles  
CONTROL MEASURE Parking Expansion at Rail Stations: Construction of Planned 4,539 New  
Parking Spaces at Rail Stations Throughout the Philadelphia Region

DESCRIPTION

Criteria for Evaluating Ozone Control Measures (Revised 6/20)	
<b>COST</b>	
Capital Cost	\$14,751,750 - based on 4,539 new spaces at an average of \$3,250 per space. (SEPTA cost ranges from \$3,000 to \$3,500 per space, exclusive of land acquisition). Amortized over 10 years at 8%.
Operating and Maintenance Cost:	None assumed.
Annualized Direct Costs:	\$2,198,400.
Administrative Costs/Issues:	None assumed.
<b>EFFICIENCY</b>	
Control Efficiency - % reduction from uncontrolled levels	VOC .04%; NO <sub>x</sub> .04%.
Applicability - how many sources, their size	Based on CMAQ methodology, assume 43,860 reduction in daily VMT, 3,720 increase in vehicle trips (change in mode split).
Emission Reductions by Pollutant-estimated reductions -	VOC only, NO <sub>x</sub> only, VOC and NO <sub>x</sub> combined
Per Day: VOC .027; NO <sub>x</sub> .043; Combined: .07	
Permanence	Benefits continue, will increase if carpool rates to stations increase and if utilization increases.
Measurable	Lot usage can be monitored; estimates of reduced mileage can be based on census, surveys, etc.
Availability	

**COST-EFFECTIVENESS** - cost/ton for each precursor and for both precursors combined, over the lifetime of the control: 2005 amortized cost per day over 2005 benefit in tons.  
VOC: \$274,150; NO<sub>x</sub>: \$169,950; Combined: \$104,900

#### IMPLEMENTABILITY

Enforcement

Voluntary program, can be attractive alternative to driving downtown.

Ease of Determining Compliance: Not applicable.

Implementation Ease: Capital construction program - reduced funding may reduce program.

Timing of Reductions: Most lots due for completion in 1997, one in 1996.

Publicly Acceptable

Very. Good alternative to driving. Some lot locations may generate local traffic but should not be a problem.

Politically Acceptable

Yes. Environmentally perceived as "friendly."

Consensual

Yes.

Voluntary

Yes.

Who Pays - Fairness

State and Federal and SEPTA combine to pay for capital, maximum match 80 percent Federal (depending on funding availability). SEPTA responsible for operating cost. Ultimately riders and taxpayers pay.

Location

Throughout Philadelphia area - 4,539 spaces altogether.

Bucks Co - 1,930

Delaware - 440

Montgomery - 1,146

Philadelphia - 115, Chester - 908

## **SECONDARY EFFECTS**

Secondary Pollutant Benefits - CO, HAPS, etc.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Secondary Costs



MEASURE NO. 74  
SOURCE CATEGORY Highway Vehicles  
CONTROL MEASURE Removal of 50 Percent of Pre-1980 Vehicles

DESCRIPTION

The DVRPC/COMSIS report on transportation measures evaluated 1996 emission benefits of removing 50 percent of pre-1980 light-duty vehicles. This measure re-evaluates these benefits for 2005, when much fewer cars are pre-1980 model years.

Criteria for Evaluating Ozone Control Measures (Revised 6/20)	
<b>COST</b>	
Capital Cost	The cost used in the cost effectiveness calculation for this measure is \$700 per vehicle purchased, plus the public administration fee of \$50.
Operating and Maintenance Cost	
Annualized Direct Costs	
Administrative Costs/Issues	
<b>EFFICIENCY</b>	
Control Efficiency - % reduction from uncontrolled levels	A 0.05 to 0.7 percent VOC reduction and 0.01 to 0.3 percent NO <sub>x</sub> reduction are estimated. These relatively small emission decreases occur because only 1.2 percent of the light-duty fleet in SE Pennsylvania is expected to be 25 years old in 2005. The biggest emission reductions were estimated for the case where 25 year old cars are replaced with cars only distributed from 1 to 24 years old.
Applicability - how many sources, their size	
Passenger cars that would be 25 years old, or older, in 2005.	
Emission Reductions by Pollutant-estimated reductions -	
VOC only, NO <sub>x</sub> only, VOC and NO <sub>x</sub> combined	
VOC reductions are 0.03 to 0.44 tpd. NO <sub>x</sub> reductions are 0.01 to 0.31 tpd.	

Permanence

This could either be a one-time reduction, or a continuing program.

Measurable

Availability

**COST-EFFECTIVENESS** - cost/ton for each precursor and for both precursors combined, over the lifetime of the control

**IMPLEMENTABILITY**

Enforcement

Ease of Determining Compliance

Implementation Ease

Timing of Reductions

Publicly Acceptable

Politically Acceptable

Consensual

Voluntary

Who Pays - Fairness

Location

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#### **SECONDARY EFFECTS**

Secondary Pollutant Benefits - CO, HAPS, etc.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Secondary Costs



MEASURE NO. 128

SOURCE CATEGORY Highway Vehicles and Non-road Gasoline

CONTROL MEASURE Expand Reformulated Gasoline to Counties North and West of Five County Area

DESCRIPTION

This measure examines expanding the required reformulated gasoline area to Berks, Lancaster, Lehigh, and Northampton counties.

Criteria for Evaluating Ozone Control Measures (Revised 6/20)	
<b>COST</b>	
Capital Cost	It is unknown whether refineries made the capital investment needed to phase II RFG requirements when they made plans to deliver phase I RFG to opt-in areas in Pennsylvania.
Operating and Maintenance Cost	Costs to motorists of phase II Federal reformulated gasoline are expected to be in the range of 6.0 to 8.6 cents per gallon compared with baseline gasoline.
Annualized Direct Costs	Motorists would pay \$30-\$43 more for gasoline per year.
Administrative Costs/Issues	
<b>EFFICIENCY</b>	
Control Efficiency - % reduction from uncontrolled levels	Highway vehicle VOC emissions would be reduced by about 26 percent in 2005 and highway vehicle NO <sub>x</sub> emissions by about 6 percent with Federal RFG II. Non-road spark ignition engine emissions would be reduced by 3.3 percent.
Applicability - how many sources, their size	
Affects emissions from gasoline-powered vehicles and engines.	

Emission Reductions by Pollutant-estimated reductions -  
VOC only, NO<sub>x</sub> only, VOC and NO<sub>x</sub> combined

	VOC		NO <sub>x</sub>	
	Without RFG	With RFG	Without RFG	With RFG
Berks County	13.7	10.2	17.5	16.5
Lancaster County	17.7	13.0	21.7	20.4
Lehigh County	15.9	11.6	17.0	16.0
Northampton County	8.7	6.4	10.9	10.2
	55.9	41.2	67.1	63.1

Permanence

Measurable

MOBILE5a can be used to estimate emission benefits for VOC. An adjustment to MOBILE5a results is used to estimate NO<sub>x</sub> benefits.

Availability

Yes.

**COST-EFFECTIVENESS** - cost/ton for each precursor and for both precursors combined, over the lifetime of the control

About \$5,000 per ton.

**IMPLEMENTABILITY**

Enforcement

Ease of Determining Compliance

Could be determined by analyzing fuel samples at service stations. EPA would have enforcement responsibility if the Commonwealth opts-in these counties to Federal program.

Implementation Ease

Timing of Reductions

Publicly Acceptable

Some people may object to paying higher gasoline prices. There has been adverse publicity about potential health effects associated with self serve exposures to phase I reformulated gasoline.

Politically Acceptable

Consensual

Voluntary

No.

Who Pays - Fairness

Costs are incurred by petroleum refineries and motorists.

Location

Berks, Lancaster, Lehigh, and Northampton counties are evaluated here. Actual program implementation could be in more, or fewer, counties.

**SECONDARY EFFECTS**

Secondary Pollutant Benefits - CO, HAPS, etc.

Benzene emissions would be lower.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Secondary Costs



**MEASURE NO. XX**

**SOURCE CATEGORY** Highway Vehicles

**CONTROL MEASURE:** Easy Pass program for toll plazas (original investigation to determine potential for HOV bypass of toll stations. After discussion of planned Easy Pass program with Steve Joachim, of Delaware River Port Authority, it appears that the Easy Pass program is likely to eliminate nearly all congestion at toll plazas, thereby reducing the HOV incentive of reduced time. There may be slight HOV benefit to be realized from a discounted toll for HOV, but would be difficult to enforce. Therefore this analysis focuses on the benefits to be realized from reduced idling at the toll plazas.

Criteria for Evaluating Ozone Control Measures (Revised 6/20)	
<b>COST</b>	
Capital Cost: \$ Not known: program will be implemented (cost not applicable?)	
Operating and Maintenance Cost: \$ Not known	
Annualized Direct Costs: \$	
Administrative Costs/Issues: None assumed.	
<b>EFFICIENCY</b>	
Control Efficiency - % reduction from uncontrolled levels	
VOC: -1.9% Nox: Data not available	

**Applicability - how many sources, their size-**

Four toll facilities, 46 toll plazas (Delaware River Port Authority only; may expand to other authorities in the future, e.g. Burlington Co. Bridge Commission); avg. 400 cars per hour per plaza during peak period (am only) per manual plaza; capacity 700 per hour with dedicated transponder; with 40% market share will virtually eliminate queueing at toll plazas.

**Emission Reductions by Pollutant-estimated reductions -**

VOC only: -.13 NO<sub>x</sub> only not known VOC and NO<sub>x</sub> combined - unknown

**Permanence - once in place should continue indefinitely and possibly expand.**

**Measurable- Changes in avg. time in queue or cars per queue fairly easy to monitor**

**Availability:** Transponders being distributed widely- free with assignment of cost to credit cards, otherwise \$10 refundable deposit.

#### **IMPLEMENTABILITY**

**Enforcement- Not applicable**

**COST-EFFECTIVENESS** - cost/ton for each precursor and for both precursors combined, over the lifetime of the control

VOC: data not available Nox: data not available

Implementation Ease: Acquiring equipment now.

Timing of Reductions: Goal: install fully by September 1997

Publicly Acceptable- Very- time savings, ease of use very commendable.

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Politically Acceptable- Yes.

Consensual- Yes

Voluntary- Yes

**Who Pays - Fairness**

The user of the service pays- very fair.

Location:

DRPA toll sites- Rt. 95

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**SECONDARY EFFECTS**

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Secondary Pollutant Benefits - CO, HAPS, etc.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Decreased travel time on tollways

Secondary Costs

Southeast Pennsylvania Ozone Stakeholders Group  
August 8-9 Meeting Presentation

E.H. Pechan & Associates, Inc.



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## **2005 VOC Emissions Distribution Five County Area**

<b>Source Categories</b>	<b>tpd</b>	<b>Percentage</b>
Fuel Combustion	3.5	0.9%
Industrial Processes	26.6	6.7
Solvent Utilization	193.8	48.8
Storage and Transport	22.4	5.6
Waste Disposal & Recycling	13.5	3.4
Highway Vehicles	66.6	16.8
Off-Highway Vehicles	67.8	17.1
Miscellaneous	2.3	0.6
<b>Total</b>	<b>397.0</b>	<b>100.0%</b>

## **2005 NO<sub>x</sub> Emissions Distribution Five County Area**

<b>Source Categories</b>	<b>tpd</b>	<b>Percentage</b>
Fuel Combustion	120.1	36%
Industrial Processes	9.4	3
Waste Disposal & Recycling	1.8	0
Highway Vehicles	105.8	32
Off-Highway Vehicles	93.8	28
Miscellaneous	0.3	0
<b>Total</b>	<b>331.0</b>	<b>100%</b>

## **Source Categories with Significant Changes VOC Emissions (tons per summer day)**

<b>Selected Categories</b>	<b>1990</b>	<b>2005</b>	<b>Percentage Reduction</b>
Petroleum Refineries	21.5	11.4	47%
Solvent Utilization	223.4	193.8	13
Service Stations	25.4	11.6	54
Hazardous Waste TSDF	12.3	3.2	74
Highway Vehicles	187.9	66.6	65
Off-Highway	88.1	67.9	23

**Source Categories with Significant Changes  
NO<sub>x</sub> Emissions (tons per summer day)**

<b>Selected Categories</b>	<b>1990</b>	<b>2005</b>	<b>Percentage Reduction</b>
Electric Utilities	63.4	37.5	41%
Industrial Fuel Combustion	86.8	56.0	35
Highway Vehicles	158.3	105.8	33
Off-Highway	99.5	93.8	6

## Five County Area VOC Emissions

<b>Source Categories</b>	<b>1990 tpd</b>	<b>2005 tpd</b>	<b>Percentage Reduction</b>
Area/Nonroad	274.1	214.4	22%
Non-Utility Point	149.0	114.5	23
Utility	1.0	1.5	(50)
Highway	187.9	66.6	65
<b>Total</b>	<b>612.0</b>	<b>397.0</b>	<b>35%</b>

**Expected Percentage Changes in Emissions by 2005**  
**Five County Area**  
**VOC Emissions**

Source Categories	1990 Emissions Contribution	2005 Emissions Contribution	Percentage Reduction from 1990	Contribution to Reduction
Area/Nonroad	45%	54%		28%
Non-Utility Point	24	29		16
Utility	0	0		0
Highway Vehicle	31	17		56
<b>Total</b>			<b>35%</b>	<b>100%</b>

**Five County Area  
NO<sub>x</sub> Emissions**

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<b>Source Categories</b>	<b>1990 tpd</b>	<b>2005 tpd</b>	<b>Percentage Reduction</b>
Area/Nonroad	122.7	118.2	4%
Non-Utility Point	106.6	69.5	35
Utility	63.4	37.5	41
Highway Vehicle	158.3	105.8	33
<b>Total</b>	<b>451.0</b>	<b>331.0</b>	<b>27%</b>

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**Expected Percentage Changes in Emissions by 2005**  
**Five County Area**  
**NO<sub>x</sub> Emissions**

Source Categories	1990 Emissions Contribution	2005 Emissions Contribution	Percentage Reduction from 1990	Contribution to Reduction
Area/Nonroad	27%	34%		4%
Non-Utility Point	24	21		31
Utility	14	11		22
Highway Vehicle	35	32		44
<b>Total</b>			<b>27%</b>	<b>100%</b>

**Ozone Season Daily VOC Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
FUEL COMB. ELEC. UTIL.	0.92	1.24	1.47				0.92	1.24	1.47
Coal	0.13	0.21	0.25				0.13	0.21	0.25
Oil	0.45	0.66	0.79				0.45	0.66	0.79
Gas	0.01	0.01	0.01				0.01	0.01	0.01
Internal Combustion	0.33	0.37	0.42				0.33	0.37	0.42
FUEL COMB. INDUSTRIAL	0.87	0.89	0.95				0.87	0.89	0.95
Coal	0.05	0.06	0.07				0.05	0.06	0.07
Oil	0.04	0.04	0.04				0.04	0.04	0.04
Gas	0.29	0.26	0.26				0.29	0.26	0.26
Other	0.00	0.00	0.00				0.00	0.00	0.00
Internal Combustion	0.48	0.52	0.59				0.48	0.52	0.59
FUEL COMB. OTHER	0.10	0.10	0.11	0.93	0.95	0.97	1.03	1.05	1.08
Commercial/Institutional Coal	0.00	0.00	0.00				0.00	0.00	0.00
Commercial/Institutional Oil	0.02	0.02	0.02	0.30	0.30	0.31	0.32	0.33	0.33
Commercial/Institutional Gas	0.03	0.03	0.04	0.62	0.64	0.66	0.65	0.67	0.69
Misc. Fuel Comb. (Except Residential)	0.05	0.05	0.05				0.05	0.05	0.05
Residential Other				0.00	0.00	0.00	0.00	0.00	0.00
CHEMICAL & ALLIED PRODUCT MFG	14.80	11.59	12.44				14.80	11.59	12.44
Organic Chemical Mfg	8.78	5.82	6.25				8.78	5.82	6.25
phenol mfg	6.58	3.53	3.79				6.58	3.53	3.79
terephthalic acid mfg	1.38	1.44	1.54				1.38	1.44	1.54
charcoal mfg	0.49	0.51	0.55				0.49	0.51	0.55
socmi reactor	0.25	0.26	0.28				0.25	0.26	0.28
other	0.08	0.08	0.09				0.08	0.08	0.09
Inorganic Chemical Mfg	0.13	0.13	0.13				0.13	0.13	0.13
Polymer & Resin Mfg	0.67	0.64	0.69				0.67	0.64	0.69
polyethylene mfg	0.48	0.45	0.48				0.48	0.45	0.48
styrene/butadiene rubber	0.00	0.00	0.00				0.00	0.00	0.00
other	0.19	0.19	0.20				0.19	0.19	0.20
Paint, Varnish, Lacquer, Enamel Mfg	1.58	1.28	1.37				1.58	1.28	1.37
paint & varnish mfg	1.01	0.97	1.04				1.01	0.97	1.04
other	0.56	0.31	0.33				0.56	0.31	0.33
Pharmaceutical Mfg	0.85	0.84	0.90				0.85	0.84	0.90
Other Chemical Mfg	2.79	2.88	3.10				2.79	2.88	3.10
printing ink mfg	0.18	0.18	0.19				0.18	0.18	0.19
other	2.61	2.70	2.90				2.61	2.70	2.90
METALS PROCESSING	0.62	0.55	0.52				0.62	0.55	0.52
Non-Ferrous Metals Processing	0.15	0.13	0.14				0.15	0.13	0.14
Ferrous Metals Processing	0.47	0.42	0.39				0.47	0.42	0.39
PETROLEUM & RELATED INDUSTRIES	21.53	19.61	11.35				21.53	19.61	11.35
Petroleum Refineries & Related Industries	21.23	19.29	11.01				21.23	19.29	11.01
vacuum distillation	1.57	1.56	1.58				1.57	1.56	1.58
cracking units	0.00	0.00	0.00				0.00	0.00	0.00

**Ozone Season Daily VOC Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia  
Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
process unit turnarounds	0.12	0.11	0.12				0.12	0.11	0.12
petroleum refinery fugitives	12.45	12.32	5.30				12.45	12.32	5.30
other	7.09	5.30	4.01				7.09	5.30	4.01
Asphalt Manufacturing	0.30	0.32	0.34				0.30	0.32	0.34
<b>OTHER INDUSTRIAL PROCESSES</b>	<b>1.32</b>	<b>1.16</b>	<b>1.28</b>	<b>0.99</b>	<b>1.01</b>	<b>1.04</b>	<b>2.31</b>	<b>2.17</b>	<b>2.32</b>
Agriculture, Food, & Kindred Products	0.55	0.30	0.31	0.99	1.01	1.04	1.53	1.31	1.35
bakeries	0.37	0.19	0.20				*0.37	0.19	0.20
other	0.17	0.11	0.11	0.99	1.01	1.04	1.16	1.12	1.15
Wood, Pulp & Paper, & Publishing Products	0.07	0.07	0.08				0.07	0.07	0.08
Rubber & Miscellaneous Plastic Products	0.61	0.69	0.79				0.61	0.69	0.79
Mineral Products	0.04	0.04	0.04				0.04	0.04	0.04
Machinery Products	0.06	0.06	0.06				0.06	0.06	0.06
Miscellaneous Industrial Processes	0.00	0.00	0.00				0.00	0.00	0.00
<b>SOLVENT UTILIZATION</b>	<b>89.30</b>	<b>71.89</b>	<b>76.84</b>	<b>134.11</b>	<b>136.10</b>	<b>116.91</b>	<b>223.41</b>	<b>207.99</b>	<b>193.75</b>
Degreasing	1.23	0.95	1.01	14.71	14.27	13.80	15.94	15.23	14.81
open top	0.19	0.20	0.21				0.19	0.20	0.21
cold cleaning	0.89	0.66	0.69				0.89	0.66	0.69
other	0.14	0.10	0.11	14.71	14.27	13.80	14.85	14.37	13.91
Graphic Arts	16.70	16.83	17.60	3.96	4.17	4.38	20.65	20.99	21.98
letterpress	0.19	0.12	0.13				0.19	0.12	0.13
flexographic	2.16	2.17	2.26				2.16	2.17	2.26
lithographic	0.60	0.62	0.71				0.60	0.62	0.71
gravure	11.50	11.78	12.27				11.50	11.78	12.27
other	2.24	2.13	2.22	3.96	4.17	4.38	6.20	6.30	6.61
Dry Cleaning	0.23	0.22	0.22	0.53	0.54	0.56	0.77	0.77	0.78
petroleum solvent	0.23	0.22	0.22				0.23	0.22	0.22
other				0.53	0.54	0.56	0.53	0.54	0.56
Surface Coating	67.98	50.63	54.49	79.47	80.90	68.56	147.45	131.52	123.05
industrial adhesives	0.87	0.82	0.91				0.87	0.82	0.91
fabrics	1.89	1.65	1.88				1.89	1.65	1.88
paper	23.90	19.28	21.19				23.90	19.28	21.19
large appliances				0.11	0.10	0.09	0.11	0.10	0.09
autos & light trucks				0.38	0.37	0.35	0.38	0.37	0.35
metal cans	1.05	0.97	1.05	7.82	7.96	7.93	8.86	8.93	8.97
metal coil	1.18	0.85	0.92				1.18	0.85	0.92
wood furniture	0.26	0.29	0.33	2.61	2.75	2.93	2.86	3.04	3.26
metal furniture	0.55	0.59	0.67	6.63	7.00	7.46	7.17	7.59	8.13
flatwood products	0.12	0.13	0.15	0.34	0.33	0.32	0.46	0.46	0.47
plastic parts	0.28	0.29	0.30				0.28	0.29	0.30
large ships				0.34	0.33	0.32	0.34	0.33	0.32
aircraft	0.43	0.45	0.48	0.36	0.41	0.46	0.79	0.86	0.95
misc. metal parts	1.48	1.56	1.69	0.53	0.54	0.54	2.01	2.10	2.23
architectural				30.55	31.22	25.71	30.55	31.22	25.71

**Ozone Season Daily VOC Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
traffic markings				2.55	2.61	2.15	2.55	2.61	2.15
maintenance coatings				4.09	3.96	3.07	4.09	3.96	3.07
railroad				0.07	0.06	0.05	0.07	0.06	0.05
auto refinishing				16.29	16.65	10.80	16.29	16.65	10.80
machinery				2.51	2.44	2.36	2.51	2.44	2.36
electronic & other electrical				0.31	0.30	0.29	0.31	0.30	0.29
general	2.69	2.50	2.64				2.69	2.50	2.64
miscellaneous	0.24	0.23	0.24				0.24	0.23	0.24
thinning solvents	1.10	0.59	0.65				1.10	0.59	0.65
other	31.94	20.41	21.37	3.99	3.87	3.74	35.93	24.28	25.11
Other Industrial	3.16	3.26	3.53				3.16	3.26	3.53
Nonindustrial				35.45	36.22	29.60	35.45	36.22	29.60
pesticide application				1.36	1.39	0.91	1.36	1.39	0.91
other				34.09	34.84	28.69	34.09	34.84	28.69
<b>STORAGE &amp; TRANSPORT</b>	<b>20.56</b>	<b>19.96</b>	<b>10.51</b>	<b>25.66</b>	<b>11.88</b>	<b>11.88</b>	<b>46.22</b>	<b>31.84</b>	<b>22.39</b>
Bulk Terminals & Plants	0.65	0.66	0.73				0.65	0.66	0.73
floating roof	0.22	0.21	0.24				0.22	0.21	0.24
efr with seals	0.01	0.01	0.01				0.01	0.01	0.01
other	0.42	0.44	0.49				0.42	0.44	0.49
Petroleum & Petroleum Product Storage	4.69	4.67	2.95	0.04	0.05	0.05	4.73	4.71	3.00
floating roof gasoline	0.74	0.74	0.18				0.74	0.74	0.18
floating roof crude	0.25	0.25	0.07				0.25	0.25	0.07
efr / seal gasoline	0.03	0.03	0.03				0.03	0.03	0.03
efr / seal crude	0.11	0.11	0.11				0.11	0.11	0.11
ifr / seal gasoline	0.03	0.03	0.03				0.03	0.03	0.03
other	3.52	3.51	2.52	0.04	0.05	0.05	3.56	3.56	2.57
Petroleum & Petroleum Product Transport	14.24	13.64	5.79	0.19	0.21	0.23	14.43	13.84	6.02
gasoline loading: balanced / submerged	1.58	1.06	1.15				1.58	1.06	1.15
gasoline loading: normal / submerged	0.03	0.03	0.04				0.03	0.03	0.04
marine vessel loading: gasoline & crude	5.26	5.19	1.90				5.26	5.19	1.90
other	7.36	7.36	2.71	0.19	0.21	0.23	7.55	7.56	2.94
Service Stations: Stage I				4.19	4.61	5.07	4.19	4.61	5.07
Service Stations: Stage II				19.57	5.18	4.50	19.57	5.18	4.50
Service Stations: Breathing & Emptying				1.67	1.84	2.02	1.67	1.84	2.02
Organic Chemical Storage	0.39	0.41	0.45				0.39	0.41	0.45
Organic Chemical Transport	0.59	0.58	0.59				0.59	0.58	0.59
<b>WASTE DISPOSAL &amp; RECYCLING</b>	<b>0.02</b>	<b>0.03</b>	<b>0.03</b>	<b>22.02</b>	<b>13.05</b>	<b>13.44</b>	<b>22.05</b>	<b>13.08</b>	<b>13.47</b>
Incineration	0.02	0.03	0.03	1.56	1.60	1.65	1.59	1.63	1.68
Open Burning				0.22	0.23	0.23	0.22	0.23	0.23
POTW				7.78	7.95	8.19	7.78	7.95	8.19
TSDF				12.30	3.12	3.21	12.30	3.12	3.21
Landfills				0.16	0.16	0.16	0.16	0.16	0.16

**Ozone Season Daily VOC Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia  
Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
<b>HIGHWAY VEHICLES</b>				187.89	139.22	66.63	187.89	139.22	66.63
Light-Duty Gas Vehicles & Motorcycles				167.67	123.87	58.95	167.67	123.87	58.95
Light-Duty Gas Trucks				14.75	10.74	4.10	14.75	10.74	4.10
Heavy-Duty Gas Vehicles				2.45	1.45	0.82	2.45	1.45	0.82
Diesels				3.04	3.17	2.75	3.04	3.17	2.75
<b>OFF-HIGHWAY</b>				88.05	88.40	67.88	88.05	88.40	67.88
Non-Road Gasoline				69.89	69.07	47.55	69.89	69.07	47.55
recreational				0.97	0.96	0.62	0.97	0.96	0.62
construction				1.79	1.79	1.17	1.79	1.79	1.17
industrial				8.14	7.64	4.66	8.14	7.64	4.66
lawn & garden				46.85	46.30	30.06	46.85	46.30	30.06
farm				0.22	0.20	0.12	0.22	0.20	0.12
recreational marine vessels				11.92	12.18	10.91	11.92	12.18	10.91
Non-Road Diesel				9.83	9.97	10.09	9.83	9.97	10.09
construction				6.59	6.83	7.07	6.59	6.83	7.07
industrial				1.48	1.44	1.39	1.48	1.44	1.39
lawn & garden				0.05	0.05	0.05	0.05	0.05	0.05
farm				1.71	1.66	1.58	1.71	1.66	1.58
Aircraft				7.19	8.37	9.42	7.19	8.37	9.42
Railroads				1.15	0.99	0.83	1.15	0.99	0.83
<b>MISCELLANEOUS</b>				2.31	2.31	2.31	2.31	2.31	2.31
Other Combustion				2.31	2.31	2.31	2.31	2.31	2.31
structural fires				2.29	2.29	2.29	2.29	2.29	2.29
forest wildfires				0.01	0.01	0.01	0.01	0.01	0.01
<b>TOTAL</b>	150	127	116	462	393	281	612	520	397

**Ozone Season Daily NOx Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
FUEL COMB. ELEC. UTIL.	63.40	69.16	37.52				63.40	69.16	37.52
Coal	28.62	27.62	10.76				28.62	27.62	10.76
bituminous	28.62	27.62	10.76				28.62	27.62	10.76
Oil	25.65	33.19	17.14				25.65	33.19	17.14
residual	24.52	32.01	15.80				24.52	32.01	15.80
distillate	1.13	1.18	1.34				1.13	1.18	1.34
Gas	4.76	5.30	6.10				4.76	5.30	6.10
natural	1.76	2.32	2.52				1.76	2.32	2.52
process	3.00	2.98	3.58				3.00	2.98	3.58
Other	0.00	0.00	0.00				0.00	0.00	0.00
Internal Combustion	4.37	3.06	3.52				4.37	3.06	3.52
FUEL COMB. INDUSTRIAL	86.83	56.84	55.97				86.83	56.84	55.97
Coal	14.95	14.31	13.65				14.95	14.31	13.65
bituminous	4.48	3.03	3.11				4.48	3.03	3.11
anthracite & lignite	10.46	11.28	10.54				10.46	11.28	10.54
Oil	10.28	5.90	5.78				10.28	5.90	5.78
residual	5.37	3.28	3.23				5.37	3.28	3.23
distillate	0.34	0.21	0.22				0.34	0.21	0.22
other	4.56	2.42	2.32				4.56	2.42	2.32
Gas	43.10	23.96	22.53				43.10	23.96	22.53
natural	25.04	14.62	12.97				25.04	14.62	12.97
process	18.06	9.35	9.56				18.06	9.35	9.56
Other	1.07	0.99	0.94				0.70	0.59	0.47
liquid waste	0.70	0.59	0.47				0.70	0.59	0.47
other	0.37	0.40	0.48						
Internal Combustion	17.44	11.67	13.08				17.44	11.67	13.08
FUEL COMB. OTHER	5.35	3.61	4.02	21.47	21.94	22.58	26.82	25.55	26.60
Commercial/Institutional Coal	0.78	0.52	0.63				0.78	0.52	0.63
Commercial/Institutional Oil	2.03	1.06	1.09	8.84	9.03	9.29	10.86	10.08	10.38
Commercial/Institutional Gas	1.82	1.58	1.83	11.77	12.03	12.38	13.59	13.61	14.21
Misc. Fuel Comb. (Except Residential)	0.72	0.45	0.48				0.72	0.45	0.48
Residential Other				0.86	0.88	0.91	0.86	0.88	0.91
CHEMICAL & ALLIED PRODUCT MFG	0.09	0.06	0.06				0.09	0.06	0.06
Inorganic Chemical Mfg	0.08	0.05	0.05				0.08	0.05	0.05
Polymer & Resin Mfg	0.01	0.01	0.02				0.01	0.01	0.02
METALS PROCESSING	1.47	0.91	0.95				1.47	0.91	0.95
Non-Ferrous Metals Processing	0.00	0.00	0.00				0.00	0.00	0.00
Ferrous Metals Processing	1.46	0.90	0.95				1.46	0.90	0.95
PETROLEUM & RELATED INDUSTRIES	9.95	6.01	6.11				9.95	6.01	6.11
Petroleum Refineries & Related Industri	9.79	5.83	5.92				9.79	5.83	5.92
Asphalt Manufacturing	0.16	0.18	0.20				0.16	0.18	0.20
OTHER INDUSTRIAL PROCESSES	2.79	2.11	2.23				2.79	2.11	2.23
Agriculture, Food, & Kindred Products	0.02	0.02	0.02				0.02	0.02	0.02
Mineral Products	2.77	2.09	2.21				2.77	2.09	2.21

**Ozone Season Daily NOx Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia  
Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
glass mfg	1.75	1.47	1.57				1.75	1.47	1.57
other	1.02	0.62	0.64				1.02	0.62	0.64
Machinery Products	0.00	0.00	0.00				0.00	0.00	0.00
<b>SOLVENT UTILIZATION</b>	<b>0.03</b>	<b>0.04</b>	<b>0.04</b>				<b>0.03</b>	<b>0.04</b>	<b>0.04</b>
Surface Coating	0.03	0.03	0.03				0.03	0.03	0.03
Other Industrial	0.00	0.00	0.00				0.00	0.00	0.00
<b>WASTE DISPOSAL &amp; RECYCLING</b>	<b>0.06</b>	<b>0.07</b>	<b>0.08</b>	<b>1.63</b>	<b>1.66</b>	<b>1.71</b>	<b>1.69</b>	<b>1.73</b>	<b>1.79</b>
Incineration	0.06	0.07	0.08	1.56	1.60	1.65	1.63	1.67	1.72
Open Burning				0.06	0.06	0.07	0.06	0.06	0.07
<b>HIGHWAY VEHICLES</b>				<b>158.31</b>	<b>149.63</b>	<b>105.82</b>	<b>158.31</b>	<b>149.63</b>	<b>105.82</b>
Light-Duty Gas Vehicles & Motorcycles				122.89	119.16	84.66	122.89	119.16	84.66
Light-Duty Gas Trucks				12.42	11.94	7.89	12.42	11.94	7.89
Heavy-Duty Gas Vehicles				2.24	2.26	1.95	2.24	2.26	1.95
Diesels				20.76	16.27	11.32	20.76	16.27	11.32
<b>OFF-HIGHWAY</b>				<b>99.48</b>	<b>100.21</b>	<b>93.84</b>	<b>99.48</b>	<b>100.21</b>	<b>93.84</b>
Non-Road Gasoline				9.02	9.01	22.04	9.02	9.01	22.04
recreational				3.50	3.58	9.32	3.50	3.58	9.32
construction				0.17	0.18	0.46	0.17	0.18	0.46
industrial				4.14	4.02	9.82	4.14	4.02	9.82
lawn & garden				0.49	0.50	1.31	0.49	0.50	1.31
farm				0.02	0.02	0.04	0.02	0.02	0.04
recreational marine vessels				0.70	0.72	1.08	0.70	0.72	1.08
Non-Road Diesel				66.72	68.23	52.93	66.72	68.23	52.93
construction				53.13	55.05	43.29	53.13	55.05	43.29
industrial				6.37	6.18	4.54	6.37	6.18	4.54
lawn & garden				0.35	0.35	0.28	0.35	0.35	0.28
farm				6.87	6.65	4.82	6.87	6.65	4.82
Aircraft				8.16	9.51	10.70	8.16	9.51	10.70
Railroads				15.57	13.46	8.19	15.57	13.46	8.19
<b>MISCELLANEOUS</b>				<b>0.29</b>	<b>0.29</b>	<b>0.29</b>	<b>0.29</b>	<b>0.29</b>	<b>0.29</b>
Other Combustion				0.29	0.29	0.29	0.29	0.29	0.29
<b>TOTAL</b>	<b>170</b>	<b>139</b>	<b>107</b>	<b>281</b>	<b>274</b>	<b>224</b>	<b>451</b>	<b>413</b>	<b>331</b>

## **NO<sub>x</sub> Emission Controls**

The 2005 emission estimates for major fuel combustors assumes Phase II of the NO<sub>x</sub> Memorandum of Understanding.

- Reduce rate of NO<sub>x</sub> emissions by 65 percent, or
- Emit NO<sub>x</sub> at no more than 0.2 pounds per million Btu.

If Phase III were to be adopted, the requirements would be:

- Reduce rate of NO<sub>x</sub> emissions by 75 percent, or
- Emit NO<sub>x</sub> at no more than 0.15 pounds per million Btu.

Estimated Five County area NO<sub>x</sub> reductions in 2005 by adopting Phase III is an additional 8 tons per day.

Highway vehicle emission reductions in 2005 from new control initiatives depend on the emission standards that vehicles are meeting in that year.

Adoption of the national, or 49-State, low emission vehicle program has 2001 and later model year vehicles meeting LEV standards.

Well maintained, warmed up cars have very low emission rates.

## **50,000 Mile Certification Standards (g/mi) for Passenger Cars Operating on Gasoline**

<b>Category</b>	<b>NMOG*</b>	<b>CO</b>	<b>NO<sub>x</sub></b>
Federal Tier 1	0.25	3.4	0.4
TLEV	0.125	3.4	0.4
LEV	0.075	3.4	0.2
ULEV	0.040	1.7	0.2

## **Implementation Schedule for the National LEV Program in the OTR (Excluding Massachusetts and New York)**

<b>Model Year</b>	<b>Implementation Rate (Percent)</b>		
	<b>Federal Tier 1</b>	<b>TLEV</b>	<b>LEV</b>
1997	60	40	0
1998	60	40	0
1999	30	40	30
2000	0	40	60
2001 and later	0	0	100

**NOTE:** Implementation schedule applies to all LDGVs and LDGT1s (up to 6,000 lb GVWR).

## Clean Fuel Vehicles

Regardless of a vehicle/fuel combination's emission characteristics, EPA analyzes emission reductions according to the standards that each vehicle meets in certification.

Emission benefits can then be computed based on these standards.

The biggest benefit for HC is in dedicated vehicles that have no gasoline tank - with associated evaporative emissions.

**Lifetime NMHC Emission Factors (g/mile)**  
**Light-Duty Vehicles**

<b>Vehicle Standards</b>	<b>Certified and Operated On</b>	<b>With Enhanced I/M</b>
Tier 1	Baseline Fuel	0.943
CFV/LEV	Federal RFG	0.582
CFV/ULEV	Federal RFG	0.56
ILEV	All Fuels	0.429
LEV-ILEV Difference		0.153



## 2005 VOC Emissions Distribution Five County Area

Source Categories	tpd	Percentage
Fuel Combustion	3.5	0.9%
Industrial Processes	26.6	6.7
Solvent Utilization	193.8	48.8
Storage and Transport	22.4	5.6
Waste Disposal & Recycling	13.5	3.4
Highway Vehicles	66.6	16.8
Off-Highway Vehicles	67.8	17.1
Miscellaneous	2.3	0.6
<b>Total</b>	<b>397.0</b>	<b>100.0%</b>

*Emission Reductions including growth  
(reflects Federal Programs + state SIP measures  
already captured)*

1990

1996

2005

NOx — 451                  413                  331

VOC — 612                  520                  397

% △ NOx      1990 - 2005      27

% △ VOC      1990 - 2005      35

## **2005 NO<sub>x</sub> Emissions Distribution Five County Area**

<b>Source Categories</b>	<b>tpd</b>	<b>Percentage</b>
Fuel Combustion	120.1	36%
Industrial Processes	9.4	3
Waste Disposal & Recycling	1.8	0
Highway Vehicles	105.8	32
Off-Highway Vehicles	93.8	28
Miscellaneous	0.3	0
<b>Total</b>	<b>331.0</b>	<b>100%</b>

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
1	Industrial Surface Coating	Add-on Controls or VOC Content Limits				0	N/A	
	Wood Furniture - Point	1997 SCAQMD Limits	0.3	0.1	25			
	Wood Furniture - Area	CTG Limits	2.9	1.0	1,800-5,900			
	Auto Body	none (more stringent levels were not identified)	0.4	0	0			
	Can Coating	CARB RACT/BARCT	9.0	2.2	4,000-5,000			
	Misc. Metal Parts	CARB RACT/BARCT	2.2	0.7	4,260			
	Plastic/Rubber/Glass Parts	SCAQMD Limits	0.3	0.2	1,110			
	Fabric/Paper Coating	SCAQMD Limits	23.1	5.5	4,000-5,000			
	Vinyl Coating	SCAQMD Limits	N/A	41%	4,000-5,000			
	Magnet Wire	none (more stringent levels were not identified)	N/A	0				
	Coil Coating	CARB RACT/BARCT	0.9	0.3	4,000-5,000			
	Metal Furniture/Appl.	CARB RACT/BARCT	7.5	1.5	4,000-5,000			
	Industrial Adhesives	SCAQMD Limits	0.9	0.8	800-6,800	0	N/A	
2	Surface Coating - Aerospace	Extend RACT, VOC Content Limit						
	Aerospace Ctg. - Point	none (assumed to be covered by MACT)		0	0			
	Aerospace Ctg. - Area	MACT/SCAQMD limits	0.5	0.3	4,000-5,000			
3	Autobody Refinishing	VOC Content Limits; CA Best Available Retrofit Control Technology				0	N/A	
	Auto Ref. - Area	SCAQMD Limits	10.8	3.8	3,700			
4	Surface Cleaning/Degreasing	CARB's Best Available Control Technology; Low-VOC Solvents				0	N/A	
	Surface Cleaning/Degreasing	SCAQMD Limits	14.8	5.9	Cost Saving \$100			
5	Gasoline Service Stations: Underground Storage Tanks	Install Pressure Vacuum (PV) Valves on Vent Line	2.0	1.9	20	0	N/A	

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
6	Bulk Terminals	Vapor Recovery System				0		
7	Petroleum Refinery Fugitive Emission Leaks	Inspection and Maintenance Program				0		
	Refinery Fugitives	More Stringent LDAR	5.3	1.9	170	0		
8	Rule Effectiveness Improvements	Increase Compliance with Regulations						
	Rule Effectiveness Improvements	Increased Compliance Activities		1.1 x X% (10% increase in the applicable effic.)				
9	Web Offset Lithography	Carbon Adsorber				0		
	Web Offset Lithography	Beyond CTG Req. (e.g., carbon adsorp.)	0.7	0.5	1,300-3,100			
10	Graphic Arts	Low-VOC Inks and Cleaning Solvents				0		
	Graphic Arts	Extend RACT to Small Sources		65 %	3,500-4,800			
11	Adhesives: Industrial	Reformulation and Product Substitution				0		
12	Pesticides	Reformulation to Lower VOC Content				0		
	Pesticides	CA FIP Rule	1.1	0.2	9,300			
13	Utility Boilers	Low-NO <sub>x</sub> Burner (LNB)						
		LNB + Overfire Air				10.8	75%	1,360-3,180
	Coal-Fired Boiler	Selective Catalytic Reduction (SCR)	0.3				40%	800-3,600
		Natural Gas Reburn (NGR)					43%	4,000-6,000
		Natural Gas Substitution					35%	890-1,360
		Selective Noncatalytic Reduction (SNCR)					30%	240-3,030
	Oil/Gas-Fired Boiler	LNB	0.8			23.2	88%	1,400-2,300
		SCR					45%	3,000
		NGR					30%	>6,000
		NGS (oil-fired units)					25%	1,000-1,400
		SNCR						

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
14	Industrial Boilers	LNB	1.0			29.0		
		LNB + Overfire Air						
		SCR					88%	2,030-2,230
		NGR					45%	3,000
		Natural Gas Substitution					30%	6,000
		SNCR					25%	1,090-1,170
15	Adipic Acid Manufacturing Plants	Thermal Reduction	0			0		
16	Nitric Acid Manufacturing Plants	Extended Absorption	0			0		
		SCR						
		Nonselective Catalytic Reduction (NSCR)						
17	Cement Manufacturing	LNB SCR SNCR (Urea-based)	0			0		
18	Glass Manufacturing	LNB	0			1.6		
		SCR					43%	2,950
		Oxy-Firing					45%	4,400
19	Gas Turbines: Natural Gas	LNB SCR + Steam Injection	0			0	70%	3,580-10,800
20	Gas Turbines: Oil	Water Injection NSCR + Water Injection	0.6			6.6	60%	2,690-8,100
21	Reciprocating IC Engines: Diesel/Oil	Ignition Timing Retard	0			0.1		
		SCR					90%	580-4,810
22		Air/Fuel (AF) Ratio Adjustment + ITR	0.5			11.3		
		SCR					90%	580-4,810
		NSCR					90%	180-310

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
23	Process Heaters: Natural Gas or Oil	Ultra-Low-NO <sub>x</sub> Burners (ULNB)	0.1			10.4	<60%	4,850-11,800
		LNB + SCR						
		LNB + SNCR					<75%	12,100-28,700
	< 25 tons/year Sources						75%	2,540-7,200
24	Iron and Steel Mills	LNB + FGR	0.4	0		1.0	20%	1,000
		LNB + SNCR					60%	400-3,700
		LNB + SCR					80%	1,200-7,200
25	Industrial, Commercial, and Institutional Combustion	RACT to Small Sources				25.2		
		RACT (LNB) to Smaller Sources: Coal Oil/Gas					50% 50%	1,600 760-1,400
26	Residential Water Heaters	LNB	0			0.9	13%	0
27	Residential Space Heaters	LNB					13%	0
28	Medical Waste Incinerators	SNCR	0			0	37%	1,000-4,000
29	Municipal Waste Incinerators	SNCR	0			0.1	45%	1,000-4,000
30	Various	Small Business Tax Incentives						
31	Highway Vehicles	Ozone destroying paint - air handling systems, car radiators						
32	Asphalt Paving	Driveways - Non-HC Asphalt						
33	Consumer Solvents	Driveways - Sealer Low VOC						
34	Transportation	Land Use Planning - Promote Community Centers						
35	Light-, Medium-, and Heavy-Duty Diesel Vehicles and Trucks	California Reformulated Diesel Program	2.8	0	N/A	11.3	0.8	\$3,700-7,700
36	Light-Duty Gasoline Vehicles and Trucks	More Remote Sensing						

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
37	Light-Duty Gasoline Vehicles and Trucks	Scrapage Programs						
38	Heavy-Duty Diesel Trucks	Vehicle Emission Inspections	2.8			11.3		
39	Light-, Medium-, and Heavy-Duty Diesel Vehicles and Trucks	Emission-Based Registration Fees						
40	Light-Duty Vehicles and Light-Duty Trucks	Eliminate Excessive Car Dealership Vehicle Starts						
41	All Vehicles	Eliminate Excessive Curb Idling						
42	Urban Buses	Emissions Reduction Credit for Heavy-Duty Buses						
42a	Highway Vehicles	Emissions Reduction Credit for Heavy-Duty Buses: Clean Diesel for SEPTA-baseline	2.8	.47	0	11.3	2.19	0
42b	Highway Vehicles	Emissions Reduction Credit for Heavy-Duty Buses: School Bus Fleet Replacement with CNG Vehicles	2.8	.30	290,800	11.3	2.32	37,350
43	All Vehicles	Smoking Vehicle Program						
44	Highway Vehicles	Traffic Flow Improvements - Advanced Signal on 50 miles of Congested Arteries	66.6	0.15	21,620	105.8	0.16	
45	Highway Vehicles	Traffic Flow Improvements - CBD Signalization		0.35	125,048		0.27	
46	Highway Vehicles	Traffic Flow Improvements - Congestion/Incident Management on Freeways		0.16	200,452		0.07	
47	Highway Vehicles	Traffic Flow Improvements - Ramp Metering		0.41	2,700		0.034	
48	Highway Vehicles	Traffic Flow Improvements - Enforce 55 mph on PA Turnpike		0.18	11,166		0.63	
49	Highway Vehicles	Transit Operations - Restore Regional Rail Service		0.01	857,915		0.02	
50	Highway Vehicles	Transit Operations - Extension of Route 66 Trackless Trolley		0.00	952,400		0.00	
51	Highway Vehicles	Transit Operations - Improve Express Service on Regional Rail		0.02	110,198		0.03	

Measure No.	Source Category	Control Measure	VOC			NOx		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
52	Highway Vehicles	Transit Operations - Systemwide Fare Reductions of 10%	66.6	0.09	109,255	105.8	0.13	
53	Highway Vehicles	Transit Operations - Systemwide Fare Reductions of 20%		0.20	99,102		0.26	
54	Highway Vehicles	Transit Operations - Systemwide Fare Reductions of 50%		0.47	112,247		0.69	
55	Highway Vehicles	Transit Operations - Improve Suburban Bus Service		0.07	45,356		0.10	
56	Highway Vehicles	Transit Operations - Transit First Principles		0.02	123,079		0.02	
57	Highway Vehicles	Transit Operations - Reuse of Surplus Light Rail and Trackless Trolleys		0.01	92,277		0.01	
58	Highway Vehicles	Transit Operations - Improve City Transit Division Service		0.09	42,637		0.09	
59	Highway Vehicles	Transit Operations - Philadelphia to Harrisburg Rail Service Improvements		0.01	619,774		0.03	
60	Highway Vehicles	Transportation Management Plans - ETRP		1.80	(36,649)		2.20	
61	Highway Vehicles	Transportation Management Plans - Comprehensive Regional Ridesharing Program		0.30	10,262		0.33	
62	Highway Vehicles	Transportation Management Plans - Availability and Promotion of \$25 Transitchek		0.12	128,691		-.14	
63	Highway Vehicles	Transportation Management Plans - Telecommuting		0.59	14,272		0.68	
64	Highway Vehicles	Transportation Management Plans - Compressed Work Weeks		0.21	11,226		0.27	
65	Highway Vehicles	Parking Management - Prohibit New Parking Facilities in CBD		Negligible Impact	Negligible Impact		Negligible Impact	
66	Highway Vehicles	Parking Management - Limit Parking Facilities at New Suburban Employment Sites		0.08	(33,728)		0.08	

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
67	Highway Vehicles	Parking Management - \$3 Parking Surcharge		1.90	(435,912)		2.50	
68	Highway Vehicles	Parking Management - \$3 Parking Tax in the CBD		0.47	(43,909)		0.73	
69	Highway Vehicles	Parking Management - Construct New Park and Ride Lots Along Highways		0.05	139,991		0.08	
70	Highway Vehicles	Parking Management - Expand Parking at Rail Stations		0.11	112,640		0.19	
71	Highway Vehicles	Non-Motorized Programs and Facilities - Comprehensive Bicycle Improvements - Auto Work Trips		0.21	48,740		0.18	
72	Highway Vehicles	Non-Motorized Programs and Facilities - Comprehensive Bicycle Improvements - 14 Rail Station Trips		0.00	65,513		0.00	
73	Highway Vehicles	Non-Motorized Programs and Facilities - Comprehensive Bicycle Improvements - Non-work Trips		0.33	21,709		0.34	
74	Highway Vehicles	Emissions Reduction Programs - Removal of 50% of Pre-1980 Vehicles	66.6	5.00	57,354	105.8	2.50	
75	Highway Vehicles	Emissions Reduction Programs - Reduction in Cold Starts		1.00	1,864		0.63	
76	Highway Vehicles	Emissions Reduction Programs - National LEV Program		11.5	1,860		13.5	
77	Highway Vehicles	Pricing Mechanisms - Feebate on New Car Purchase		0.28	4,393		0.17	
78	Highway Vehicles	Pricing Mechanisms - Gas Tax (84¢ per gallon)		5.20	(205,484)		8.70	
79	Highway Vehicles	Pricing Mechanisms - VMT Tax (4¢ per gallon)		5.20	(205,412)		8.70	
80	Highway Vehicles	Pricing Mechanisms - Double Tolls on PA Turnpike During Peak Periods		0.01	0		0.00	

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
81	Highway Vehicles	Emission Reduction Programs - Alternative Fuels - SEPTA <i>Total fleet</i>	2.8	0.14 (0.61 with 42a)	229,500 (53,300 with 42a)	11.3	2.4 (4.6 with 42c)	13,550 (7,100 with 42a)
82	Highway Vehicles	Transit Operations - Reduce SEPTA Fares July-August						
83	Highway Vehicles	Pricing Mechanisms - HOV Parking Rate Incentive						
84	Highway Vehicles	Transit Operations - Grants to Non-profits to Promote Transit						
85	Highway Vehicles <i>(4 counties)</i>	Stage II - Entire Region (Beyond 5 County)	5.0	3.3	900	0	0	
86	Highway Vehicles	Stage II - Statewide		60-70%				0
87	Highway Vehicles	Ride Sharing						
88	Highway Vehicles	Increase Mass Transit Ridership - Parking Taxes, Market Incentives						
89	Highway Vehicles	Flat Tax on Vehicles - \$200?						
90	Highway Vehicles	Build Two-Tier Highways						
91	Highway Vehicles	High Occupancy Vehicle Lanes						
92	Highway Vehicles	Traffic Flow @ 45 mph						
93	Highway Vehicles	Insulate Catalytic Converters						
94	Highway Vehicles	Promote Telecommuting						
95	Highway Vehicles	Credits for Compressed Work Week						
96	Highway Vehicles	LPG - Pilot Programs at Service Stations						
	Highway Vehicles	CNG - Pilot Programs at Service Stations	66.6	2.41	174,100	105.8	1.42	294,300
97	Highway Vehicles	Non-Employee Trip Reduction - Health Clubs						
98	Highway Vehicles	Buy New Engines for SEPTA - CNG, LPG						
	Highway Vehicles	Buy New Engines for SEPTA - LNG - Fleet Replacement Program	2.8	.14 (.61 with 42a)	337,000 (78,300 with 42a)	11.3	2.4 (4.60 with 42a)	19,900 (10,400 with 42a)

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
99	Highway Vehicles	Clean Fleet Replacement for Institutions, Large Businesses						
	Highway Vehicles	Clean Fleet Replacement for Institutions, Large Business - Light-Duty Vehicles	66.6	2.89	12,400	105.8	1.71	20,900
100	Highway Vehicles	Area Source Business - Credits for Alternative Fuel Vehicles						
101	Highway Vehicles	Voluntary ETR						
102	Highway Vehicles	Alternative Fuel Vehicle - Build Fuel Stations						
103	Marine Vessels	Control of Emissions (NO <sub>x</sub> ) from Ships and Ports		0	N/A		30%	\$10,000
104	Commercial Marine Vessels	Emission fees (\$10,000 per ton NO <sub>x</sub> )		0%	N/A		30%	\$10,000
105	Lawn and Garden	Emission Reduction Credits for Leaf Blowers; Electric Lawnmowers	30.1			1.3		
106	Lawn and Garden	Incentives for Electric Lawnmowers	30.1			1.3		
107	Nonroad	Nonroad Engine Emission Reduction Credit Programs						
108	Locomotives	Regional Railroad NO <sub>x</sub> Emissions Reduction Measure	0.8	0%		8.2	2.9-3.5%	
109	Aircraft	Control of Emissions from Aircraft and Ground Support Equipment	9.4	3.2	?	10.7	2.7	?
110	Locomotive Engines	Potential Federal NO <sub>x</sub> Emission Standards Potential CA NO <sub>x</sub> Emission Standards	0.8			8.2	3.3% 6.6%	
111	≥175 horsepower Compression Ignition (Diesel) Engines:  Construction Equipment: Scrapers, Bore/Drill Rigs, Excavators, Cranes, Off-Highway Trucks, Rubber Tired Dozers, and Off-Highway Tractors Logging Equipment: Fellers/Bunchers	California Phase II Exhaust Standards	7.1			43.3		

Measure No.	Source Category	Control Measure	VOC			NO <sub>x</sub>		
			2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton	2005 Emissions tpd	2005 Emission Reduction tpd	Cost Per Ton
112	Recreational Vehicles		0.6			9.3		
	2-stroke engine category	Potential CARB Standards						
	4-stroke engine category	Potential CARB Standards						
113	Open Burning	Ban on High Ozone Days	0.23			0.1		
114	Open Burning	Year Round Ban	0.23			0.1		
115	Commercial Lawn Care	Ban on High Ozone Days						
116	All Lawn Care	Ban on High Ozone Days	30.1			1.3		
117	Recreational Boating	Ban on High Ozone Days	10.9			1.1		
118	Motor Vehicles	Voluntary "No-Drive" Measure						
119	All Sources (or a Subset)	Cap and Trade						
120	All Sources (or a Subset)	Open Market Trade						
121	All Sources (or a Subset)	Across the Board Emission Reductions						
122	Various	School-Based Public Awareness Ozone Action						
123	Various	Promote We Care Programs to Businesses						
124	Various	Outreach and Education - Environmentally Responsible Behavior - Green Light						
125	Various	Environmental Think Tank						
126	Various	Buying Emission Reduction Credits So They Cannot be Used (NO <sub>x</sub> and VOC)			Market Price			Market Price
127	Various	Reduce ERCs by X% per Year While They Are in the Bank (NO <sub>x</sub> and VOC)			Market Price			Market Price
128	Highway Vehicles and Non-road	Expand Reform Gas Area to Counties North and West of Five County Area						

## Source Categories with Significant Changes VOC Emissions (tons per summer day)

<b>Selected Categories</b>	<b>1990</b>	<b>2005</b>	<b>Percentage Reduction</b>
Petroleum Refineries	21.5	11.4	47%
Solvent Utilization	223.4	193.8	13
Service Stations	25.4	11.6	54
Hazardous Waste TSDF	12.3	3.2	74
Highway Vehicles	187.9	66.6	65
Off-Highway	88.1	67.9	23

**Source Categories with Significant Changes  
NO<sub>x</sub> Emissions (tons per summer day)**

<b>Selected Categories</b>	<b>1990</b>	<b>2005</b>	<b>Percentage Reduction</b>
Electric Utilities	63.4	37.5	41%
Industrial Fuel Combustion	86.8	56.0	35
Highway Vehicles	158.3	105.8	33
Off-Highway	99.5	93.8	6

## **Five County Area VOC Emissions**

<b>Source Categories</b>	<b>1990 tpd</b>	<b>2005 tpd</b>	<b>Percentage Reduction</b>
Area/Nonroad	274.1	214.4	22%
Non-Utility Point	149.0	114.5	23
Utility	1.0	1.5	(50)
Highway	187.9	66.6	65
<b>Total</b>	<b>612.0</b>	<b>397.0</b>	<b>35%</b>

**Expected Percentage Changes in Emissions by 2005**  
**Five County Area**  
**VOC Emissions**

Source Categories	1990 Emissions Contribution	2005 Emissions Contribution	Percentage Reduction from 1990	Contribution to Reduction
Area/Nonroad	45%	54%		28%
Non-Utility Point	24	29		16
Utility	0	0		0
Highway Vehicle	31	17		56
<b>Total</b>			<b>35%</b>	<b>100%</b>

## **Five County Area NO<sub>x</sub> Emissions**

<b>Source Categories</b>	<b>1990 tpd</b>	<b>2005 tpd</b>	<b>Percentage Reduction</b>
Area/Nonroad	122.7	118.2	4%
Non-Utility Point	106.6	69.5	35
Utility	63.4	37.5	41
Highway Vehicle	158.3	105.8	33
<b>Total</b>	<b>451.0</b>	<b>331.0</b>	<b>27%</b>

**Expected Percentage Changes in Emissions by 2005**  
**Five County Area**  
**NO<sub>x</sub> Emissions**

Source Categories	1990 Emissions Contribution	2005 Emissions Contribution	Percentage Reduction from 1990	Contribution to Reduction
Area/Nonroad	27%	34%		4%
Non-Utility Point	24	21		31
Utility	14	11		22
Highway Vehicle	35	32		44
<b>Total</b>			<b>27%</b>	<b>100%</b>

**Ozone Season Daily VOC Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
FUEL COMB. ELEC. UTIL.	0.92	1.24	1.47				0.92	1.24	1.47
Coal	0.13	0.21	0.25				0.13	0.21	0.25
Oil	0.45	0.66	0.79				0.45	0.66	0.79
Gas	0.01	0.01	0.01				0.01	0.01	0.01
Internal Combustion	0.33	0.37	0.42				0.33	0.37	0.42
FUEL COMB. INDUSTRIAL	0.87	0.89	0.95				0.87	0.89	0.95
Coal	0.05	0.06	0.07				0.05	0.06	0.07
Oil	0.04	0.04	0.04				0.04	0.04	0.04
Gas	0.29	0.26	0.26				0.29	0.26	0.26
Other	0.00	0.00	0.00				0.00	0.00	0.00
Internal Combustion	0.48	0.52	0.59				0.48	0.52	0.59
FUEL COMB. OTHER	0.10	0.10	0.11	0.93	0.95	0.97	1.03	1.05	1.08
Commercial/Institutional Coal	0.00	0.00	0.00				0.00	0.00	0.00
Commercial/Institutional Oil	0.02	0.02	0.02	0.30	0.30	0.31	0.32	0.33	0.33
Commercial/Institutional Gas	0.03	0.03	0.04	0.62	0.64	0.66	0.65	0.67	0.69
Misc. Fuel Comb. (Except Residential)	0.05	0.05	0.05				0.05	0.05	0.05
Residential Other				0.00	0.00	0.00	0.00	0.00	0.00
CHEMICAL & ALLIED PRODUCT MFG	14.80	11.59	12.44				14.80	11.59	12.44
Organic Chemical Mfg	8.78	5.82	6.25				8.78	5.82	6.25
phenol mfg	6.58	3.53	3.79				6.58	3.53	3.79
terephthalic acid mfg	1.38	1.44	1.54				1.38	1.44	1.54
charcoal mfg	0.49	0.51	0.55				0.49	0.51	0.55
socmi reactor	0.25	0.26	0.28				0.25	0.26	0.28
other	0.08	0.08	0.09				0.08	0.08	0.09
Inorganic Chemical Mfg	0.13	0.13	0.13				0.13	0.13	0.13
Polymer & Resin Mfg	0.67	0.64	0.69				0.67	0.64	0.69
polyethylene mfg	0.48	0.45	0.48				0.48	0.45	0.48
styrene/butadiene rubber	0.00	0.00	0.00				0.00	0.00	0.00
other	0.19	0.19	0.20				0.19	0.19	0.20
Paint, Varnish, Lacquer, Enamel Mfg	1.58	1.28	1.37				1.58	1.28	1.37
paint & varnish mfg	1.01	0.97	1.04				1.01	0.97	1.04
other	0.56	0.31	0.33				0.56	0.31	0.33
Pharmaceutical Mfg	0.85	0.84	0.90				0.85	0.84	0.90
Other Chemical Mfg	2.79	2.88	3.10				2.79	2.88	3.10
printing ink mfg	0.18	0.18	0.19				0.18	0.18	0.19
other	2.61	2.70	2.90				2.61	2.70	2.90
METALS PROCESSING	0.62	0.55	0.52				0.62	0.55	0.52
Non-Ferrous Metals Processing	0.15	0.13	0.14				0.15	0.13	0.14
Ferrous Metals Processing	0.47	0.42	0.39				0.47	0.42	0.39
PETROLEUM & RELATED INDUSTRIES	21.53	19.61	11.35				21.53	19.61	11.35
Petroleum Refineries & Related Industries	21.23	19.29	11.01				21.23	19.29	11.01
vacuum distillation	1.57	1.56	1.58				1.57	1.56	1.58
cracking units	0.00	0.00	0.00				0.00	0.00	0.00

**Ozone Season Daily VOC Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia  
Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
process unit turnarounds	0.12	0.11	0.12				0.12	0.11	0.12
petroleum refinery fugitives	12.45	12.32	5.30				12.45	12.32	5.30
other	7.09	5.30	4.01				7.09	5.30	4.01
Asphalt Manufacturing	0.30	0.32	0.34				0.30	0.32	0.34
<b>OTHER INDUSTRIAL PROCESSES</b>	<b>1.32</b>	<b>1.16</b>	<b>1.28</b>	<b>0.99</b>	<b>1.01</b>	<b>1.04</b>	<b>2.31</b>	<b>2.17</b>	<b>2.32</b>
Agriculture, Food, & Kindred Products	0.55	0.30	0.31	0.99	1.01	1.04	1.53	1.31	1.35
bakeries	0.37	0.19	0.20				0.37	0.19	0.20
other	0.17	0.11	0.11	0.99	1.01	1.04	1.16	1.12	1.15
Wood, Pulp & Paper, & Publishing Products	0.07	0.07	0.08				0.07	0.07	0.08
Rubber & Miscellaneous Plastic Products	0.61	0.69	0.79				0.61	0.69	0.79
Mineral Products	0.04	0.04	0.04				0.04	0.04	0.04
Machinery Products	0.06	0.06	0.06				0.06	0.06	0.06
Miscellaneous Industrial Processes	0.00	0.00	0.00				0.00	0.00	0.00
<b>SOLVENT UTILIZATION</b>	<b>89.30</b>	<b>71.89</b>	<b>76.84</b>	<b>134.11</b>	<b>136.10</b>	<b>116.91</b>	<b>223.41</b>	<b>207.99</b>	<b>193.75</b>
Degreasing	1.23	0.95	1.01	14.71	14.27	13.80	15.94	15.23	14.81
open top	0.19	0.20	0.21				0.19	0.20	0.21
cold cleaning	0.89	0.66	0.69				0.89	0.66	0.69
other	0.14	0.10	0.11	14.71	14.27	13.80	14.85	14.37	13.91
Graphic Arts	16.70	16.83	17.60	3.96	4.17	4.38	20.65	20.99	21.98
letterpress	0.19	0.12	0.13				0.19	0.12	0.13
flexographic	2.16	2.17	2.26				2.16	2.17	2.26
lithographic	0.60	0.62	0.71				0.60	0.62	0.71
gravure	11.50	11.78	12.27				11.50	11.78	12.27
other	2.24	2.13	2.22	3.96	4.17	4.38	6.20	6.30	6.61
Dry Cleaning	0.23	0.22	0.22	0.53	0.54	0.56	0.77	0.77	0.78
petroleum solvent	0.23	0.22	0.22				0.23	0.22	0.22
other				0.53	0.54	0.56	0.53	0.54	0.56
Surface Coating	67.98	50.63	54.49	79.47	80.90	68.56	147.45	131.52	123.05
industrial adhesives	0.87	0.82	0.91				0.87	0.82	0.91
fabrics	1.89	1.65	1.88				1.89	1.65	1.88
paper	23.90	19.28	21.19				23.90	19.28	21.19
large appliances				0.11	0.10	0.09	0.11	0.10	0.09
autos & light trucks				0.38	0.37	0.35	0.38	0.37	0.35
metal cans	1.05	0.97	1.05	7.82	7.96	7.93	8.86	8.93	8.97
metal coil	1.18	0.85	0.92				1.18	0.85	0.92
wood furniture	0.26	0.29	0.33	2.61	2.75	2.93	2.86	3.04	3.26
metal furniture	0.55	0.59	0.67	6.63	7.00	7.46	7.17	7.59	8.13
flatwood products	0.12	0.13	0.15	0.34	0.33	0.32	0.46	0.46	0.47
plastic parts	0.28	0.29	0.30				0.28	0.29	0.30
large ships				0.34	0.33	0.32	0.34	0.33	0.32
aircraft	0.43	0.45	0.48	0.36	0.41	0.46	0.79	0.86	0.95
misc. metal parts	1.48	1.56	1.69	0.53	0.54	0.54	2.01	2.10	2.23
architectural				30.55	31.22	25.71	30.55	31.22	25.71

**Ozone Season Daily VOC Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
traffic markings				2.55	2.61	2.15	2.55	2.61	2.15
maintenance coatings				4.09	3.96	3.07	4.09	3.96	3.07
railroad				0.07	0.06	0.05	0.07	0.06	0.05
auto refinishing				16.29	16.65	10.80	16.29	16.65	10.80
machinery				2.51	2.44	2.36	2.51	2.44	2.36
electronic & other electrical				0.31	0.30	0.29	0.31	0.30	0.29
general	2.69	2.50	2.64				2.69	2.50	2.64
miscellaneous	0.24	0.23	0.24				0.24	0.23	0.24
thinning solvents	1.10	0.59	0.65				1.10	0.59	0.65
other	31.94	20.41	21.37	3.99	3.87	3.74	35.93	24.28	25.11
Other Industrial	3.16	3.26	3.53				3.16	3.26	3.53
Nonindustrial				35.45	36.22	29.60	35.45	36.22	29.60
pesticide application				1.36	1.39	0.91	1.36	1.39	0.91
other				34.09	34.84	28.69	34.09	34.84	28.69
<b>STORAGE &amp; TRANSPORT</b>	<b>20.56</b>	<b>19.96</b>	<b>10.51</b>	<b>25.66</b>	<b>11.88</b>	<b>11.88</b>	<b>46.22</b>	<b>31.84</b>	<b>22.39</b>
Bulk Terminals & Plants	0.65	0.66	0.73				0.65	0.66	0.73
floating roof	0.22	0.21	0.24				0.22	0.21	0.24
efr with seals	0.01	0.01	0.01				0.01	0.01	0.01
other	0.42	0.44	0.49				0.42	0.44	0.49
Petroleum & Petroleum Product Storage	4.69	4.67	2.95	0.04	0.05	0.05	4.73	4.71	3.00
floating roof gasoline	0.74	0.74	0.18				0.74	0.74	0.18
floating roof crude	0.25	0.25	0.07				0.25	0.25	0.07
efr / seal gasoline	0.03	0.03	0.03				0.03	0.03	0.03
efr / seal crude	0.11	0.11	0.11				0.11	0.11	0.11
ifr / seal gasoline	0.03	0.03	0.03				0.03	0.03	0.03
other	3.52	3.51	2.52	0.04	0.05	0.05	3.56	3.56	2.57
Petroleum & Petroleum Product Transport	14.24	13.64	5.79	0.19	0.21	0.23	14.43	13.84	6.02
gasoline loading: balanced / submerged	1.58	1.06	1.15				1.58	1.06	1.15
gasoline loading: normal / submerged	0.03	0.03	0.04				0.03	0.03	0.04
marine vessel loading: gasoline & crude	5.26	5.19	1.90				5.26	5.19	1.90
other	7.36	7.36	2.71	0.19	0.21	0.23	7.55	7.56	2.94
Service Stations: Stage I				4.19	4.61	5.07	4.19	4.61	5.07
Service Stations: Stage II				19.57	5.18	4.50	19.57	5.18	4.50
Service Stations: Breathing & Emptying				1.67	1.84	2.02	1.67	1.84	2.02
Organic Chemical Storage	0.39	0.41	0.45				0.39	0.41	0.45
Organic Chemical Transport	0.59	0.58	0.59				0.59	0.58	0.59
<b>WASTE DISPOSAL &amp; RECYCLING</b>	<b>0.02</b>	<b>0.03</b>	<b>0.03</b>	<b>22.02</b>	<b>13.05</b>	<b>13.44</b>	<b>22.05</b>	<b>13.08</b>	<b>13.47</b>
Incineration	0.02	0.03	0.03	1.56	1.60	1.65	1.59	1.63	1.68
Open Burning				0.22	0.23	0.23	0.22	0.23	0.23
POTW				7.78	7.95	8.19	7.78	7.95	8.19
TSDF				12.30	3.12	3.21	12.30	3.12	3.21
Landfills				0.16	0.16	0.16	0.16	0.16	0.16

**Ozone Season Daily VOC Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia  
Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
HIGHWAY VEHICLES				187.89	139.22	66.63	187.89	139.22	66.63
Light-Duty Gas Vehicles & Motorcycles				167.67	123.87	58.95	167.67	123.87	58.95
Light-Duty Gas Trucks				14.75	10.74	4.10	14.75	10.74	4.10
Heavy-Duty Gas Vehicles				2.45	1.45	0.82	2.45	1.45	0.82
Diesels				3.04	3.17	2.75	3.04	3.17	2.75
	88.05	88.40	67.88				88.05	88.40	67.88
OFF-HIGHWAY				69.89	69.07	47.55	69.89	69.07	47.55
Non-Road Gasoline				0.97	0.96	0.62	0.97	0.96	0.62
recreational				1.79	1.79	1.17	1.79	1.79	1.17
construction				8.14	7.64	4.66	8.14	7.64	4.66
industrial				46.85	46.30	30.06	46.85	46.30	30.06
lawn & garden				0.22	0.20	0.12	0.22	0.20	0.12
farm				11.92	12.18	10.91	11.92	12.18	10.91
recreational marine vessels				9.83	9.97	10.09	9.83	9.97	10.09
Non-Road Diesel				6.59	6.83	7.07	6.59	6.83	7.07
construction				1.48	1.44	1.39	1.48	1.44	1.39
industrial				0.05	0.05	0.05	0.05	0.05	0.05
lawn & garden				1.71	1.66	1.58	1.71	1.66	1.58
farm				7.19	8.37	9.42	7.19	8.37	9.42
Aircraft				1.15	0.99	0.83	1.15	0.99	0.83
Railroads				2.31	2.31	2.31	2.31	2.31	2.31
MISCELLANEOUS				2.31	2.31	2.31	2.31	2.31	2.31
Other Combustion				2.31	2.31	2.31	2.31	2.31	2.31
structural fires				2.29	2.29	2.29	2.29	2.29	2.29
forest wildfires				0.01	0.01	0.01	0.01	0.01	0.01
TOTAL	150	127	116	462	393	281	612	520	397

**Ozone Season Daily NOx Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
FUEL COMB. ELEC. UTIL.	63.40	69.16	37.52				63.40	69.16	37.52
Coal	28.62	27.62	10.76				28.62	27.62	10.76
bituminous	28.62	27.62	10.76				28.62	27.62	10.76
Oil	25.65	33.19	17.14				25.65	33.19	17.14
residual	24.52	32.01	15.80				24.52	32.01	15.80
distillate	1.13	1.18	1.34				1.13	1.18	1.34
Gas	4.76	5.30	6.10				4.76	5.30	6.10
natural	1.76	2.32	2.52				1.76	2.32	2.52
process	3.00	2.98	3.58				3.00	2.98	3.58
Other	0.00	0.00	0.00				0.00	0.00	0.00
Internal Combustion	4.37	3.06	3.52				4.37	3.06	3.52
FUEL COMB. INDUSTRIAL	86.83	56.84	55.97				86.83	56.84	55.97
Coal	14.95	14.31	13.65				14.95	14.31	13.65
bituminous	4.48	3.03	3.11				4.48	3.03	3.11
anthracite & lignite	10.46	11.28	10.54				10.46	11.28	10.54
Oil	10.28	5.90	5.78				10.28	5.90	5.78
residual	5.37	3.28	3.23				5.37	3.28	3.23
distillate	0.34	0.21	0.22				0.34	0.21	0.22
other	4.56	2.42	2.32				4.56	2.42	2.32
Gas	43.10	23.96	22.53				43.10	23.96	22.53
natural	25.04	14.62	12.97				25.04	14.62	12.97
process	18.06	9.35	9.56				18.06	9.35	9.56
Other	1.07	0.99	0.94				0.70	0.59	0.47
liquid waste	0.70	0.59	0.47				0.70	0.59	0.47
other	0.37	0.40	0.48						
Internal Combustion	17.44	11.67	13.08				17.44	11.67	13.08
FUEL COMB. OTHER	5.35	3.61	4.02	21.47	21.94	22.58	26.82	25.55	26.60
Commercial/Institutional Coal	0.78	0.52	0.63				0.78	0.52	0.63
Commercial/Institutional Oil	2.03	1.06	1.09	8.84	9.03	9.29	10.86	10.08	10.38
Commercial/Institutional Gas	1.82	1.58	1.83	11.77	12.03	12.38	13.59	13.61	14.21
Misc. Fuel Comb. (Except Residential)	0.72	0.45	0.48				0.72	0.45	0.48
Residential Other				0.86	0.88	0.91	0.86	0.88	0.91
CHEMICAL & ALLIED PRODUCT MFG	0.09	0.06	0.06				0.09	0.06	0.06
Inorganic Chemical Mfg	0.08	0.05	0.05				0.08	0.05	0.05
Polymer & Resin Mfg	0.01	0.01	0.02				0.01	0.01	0.02
METALS PROCESSING	1.47	0.91	0.95				1.47	0.91	0.95
Non-Ferrous Metals Processing	0.00	0.00	0.00				0.00	0.00	0.00
Ferrous Metals Processing	1.46	0.90	0.95				1.46	0.90	0.95
PETROLEUM & RELATED INDUSTRIES	9.95	6.01	6.11				9.95	6.01	6.11
Petroleum Refineries & Related Industri	9.79	5.83	5.92				9.79	5.83	5.92
Asphalt Manufacturing	0.16	0.18	0.20				0.16	0.18	0.20
OTHER INDUSTRIAL PROCESSES	2.79	2.11	2.23				2.79	2.11	2.23
Agriculture, Food, & Kindred Products	0.02	0.02	0.02				0.02	0.02	0.02
Mineral Products	2.77	2.09	2.21				2.77	2.09	2.21

**Ozone Season Daily NOx Emission Estimates for the Five Counties in Pennsylvania in the Philadelphia  
Nonattainment Area (short tons per day)**

Source Category	Point Sources			Area Sources			Total		
	1990	1996	2005	1990	1996	2005	1990	1996	2005
glass mfg	1.75	1.47	1.57				1.75	1.47	1.57
other	1.02	0.62	0.64				1.02	0.62	0.64
Machinery Products	0.00	0.00	0.00				0.00	0.00	0.00
<b>SOLVENT UTILIZATION</b>	<b>0.03</b>	<b>0.04</b>	<b>0.04</b>				<b>0.03</b>	<b>0.04</b>	<b>0.04</b>
Surface Coating	0.03	0.03	0.03				0.03	0.03	0.03
Other Industrial	0.00	0.00	0.00				0.00	0.00	0.00
<b>WASTE DISPOSAL &amp; RECYCLING</b>	<b>0.06</b>	<b>0.07</b>	<b>0.08</b>	<b>1.63</b>	<b>1.66</b>	<b>1.71</b>	<b>1.69</b>	<b>1.73</b>	<b>1.79</b>
Incineration	0.06	0.07	0.08	1.56	1.60	1.65	1.63	1.67	1.72
Open Burning				0.06	0.06	0.07	0.06	0.06	0.07
<b>HIGHWAY VEHICLES</b>				<b>158.31</b>	<b>149.63</b>	<b>105.82</b>	<b>158.31</b>	<b>149.63</b>	<b>105.82</b>
Light-Duty Gas Vehicles & Motorcycles				122.89	119.16	84.66	122.89	119.16	84.66
Light-Duty Gas Trucks				12.42	11.94	7.89	12.42	11.94	7.89
Heavy-Duty Gas Vehicles				2.24	2.26	1.95	2.24	2.26	1.95
Diesels				20.76	16.27	11.32	20.76	16.27	11.32
				<b>99.48</b>	<b>100.21</b>	<b>93.84</b>	<b>99.48</b>	<b>100.21</b>	<b>93.84</b>
<b>OFF-HIGHWAY</b>				9.02	9.01	22.04	9.02	9.01	22.04
Non-Road Gasoline				3.50	3.58	9.32	3.50	3.58	9.32
recreational				0.17	0.18	0.46	0.17	0.18	0.46
construction				4.14	4.02	9.82	4.14	4.02	9.82
industrial				0.49	0.50	1.31	0.49	0.50	1.31
lawn & garden				0.02	0.02	0.04	0.02	0.02	0.04
farm				0.70	0.72	1.08	0.70	0.72	1.08
recreational marine vessels				66.72	68.23	52.93	66.72	68.23	52.93
Non-Road Diesel				53.13	55.05	43.29	53.13	55.05	43.29
construction				6.37	6.18	4.54	6.37	6.18	4.54
industrial				0.35	0.35	0.28	0.35	0.35	0.28
lawn & garden				6.87	6.65	4.82	6.87	6.65	4.82
farm				8.16	9.51	10.70	8.16	9.51	10.70
Aircraft				15.57	13.46	8.19	15.57	13.46	8.19
Railroads				<b>0.29</b>	<b>0.29</b>	<b>0.29</b>	<b>0.29</b>	<b>0.29</b>	<b>0.29</b>
<b>MISCELLANEOUS</b>				0.29	0.29	0.29	0.29	0.29	0.29
Other Combustion									
<b>TOTAL</b>	<b>170</b>	<b>139</b>	<b>107</b>	<b>281</b>	<b>274</b>	<b>224</b>	<b>451</b>	<b>413</b>	<b>331</b>

## **NO<sub>x</sub> Emission Controls**

The 2005 emission estimates for major fuel combustors assumes Phase II of the NO<sub>x</sub> Memorandum of Understanding.

- Reduce rate of NO<sub>x</sub> emissions by 65 percent, or
- Emit NO<sub>x</sub> at no more than 0.2 pounds per million Btu.

If Phase III were to be adopted, the requirements would be:

- Reduce rate of NO<sub>x</sub> emissions by 75 percent, or
- Emit NO<sub>x</sub> at no more than 0.15 pounds per million Btu.

Estimated Five County area NO<sub>x</sub> reductions in 2005 by adopting Phase III is an additional 8 tons per day.

Highway vehicle emission reductions in 2005 from new control initiatives depend on the emission standards that vehicles are meeting in that year.

Adoption of the national, or 49-State, low emission vehicle program has 2001 and later model year vehicles meeting LEV standards.

Well maintained, warmed up cars have very low emission rates.

## **50,000 Mile Certification Standards (g/mi) for Passenger Cars Operating on Gasoline**

<b>Category</b>	<b>NMOG*</b>	<b>CO</b>	<b>NO<sub>x</sub></b>
Federal Tier 1	0.25	3.4	0.4
TLEV	0.125	3.4	0.4
LEV	0.075	3.4	0.2
ULEV	0.040	1.7	0.2

## **Implementation Schedule for the National LEV Program in the OTR (Excluding Massachusetts and New York)**

<b>Model Year</b>	<b>Implementation Rate (Percent)</b>		
	<b>Federal Tier 1</b>	<b>TLEV</b>	<b>LEV</b>
1997	60	40	0
1998	60	40	0
1999	30	40	30
2000	0	40	60
2001 and later	0	0	100

**NOTE:** Implementation schedule applies to all LDGVs and LDGT1s (up to 6,000 lb GVWR).

## Clean Fuel Vehicles

Regardless of a vehicle/fuel combination's emission characteristics, EPA analyzes emission reductions according to the standards that each vehicle meets in certification.

Emission benefits can then be computed based on these standards.

The biggest benefit for HC is in dedicated vehicles that have no gasoline tank - with associated evaporative emissions.

## Lifetime NMHC Emission Factors (g/mile) Light-Duty Vehicles

<b>Vehicle Standards</b>	<b>Certified and Operated On</b>	<b>With Enhanced I/M</b>
Tier 1	Baseline Fuel	0.943
CFV/LEV	Federal RFG	0.582
CFV/ULEV	Federal RFG	0.56
ILEV - es. dedicated CNG. no HCs emissions	All Fuels	0.429
LEV-ILEV Difference		0.153

Net benefit  
 is  
 need  
 more vehicle  
 conversion to  
 see a benefit

